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NONRETURN RATES OF ARTIFICIAL INSEMINATION (AI) SIRES BY BREEDS IN THE UNITED STATES FOR 1967 AND 1968

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Data for dairy bulls used in artificial insemination (AI) in the United States were summarized to determine the average 60- to 90-day nonreturns to first service and to examine the relationship between this commonly used indicator of semen fertility and the number of first services to dairy bulls. The term "60- to 90-day nonreturn" is used to refer to an animal that is not rebred by the same AI organization within a period before 60 to 90 days after the first insemination depending upon when the first insemination was done during the month.

Twenty-one AI organizations in the United States furnished information for 1968 and 22 furnished information for 1967 on both the number of first services and percent of 60- to 90-day nonreturns for individual bulls. They also categorized bulls according to their type of service as (1) regular service, meaning semen was widely and generally available; (2) special request, meaning service was available only

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through special arrangements by dairymen; or (3) in progeny testing, implying distribution was primarily for the purpose of obtaining an evaluation of genetic merit in a large number of herds.

The number of bulls and the total inseminations by breed and type of service, for which nonreturn data were available, are given in table 1 for 1968 and in table 2 for 1967. In 1968, 1,176 bulls accounted for 5,513,304 first services--86 percent of all AI dairy-to-dairy services. In 1967, 1,144 bulls accounted for 5,096,457 first services--81 percent of all AI dairy-to-dairy services.

The average 60- to 90-day nonreturn rates for the first services reported are given by breed and type of service in table 3 for 1968 and table 4 for 1967. The nonreturn rates were averaged both by ignoring the number of services and by weighting the number of services for each bull.

It is evident that the weighted 60- to 90-day nonreturn rates are generally higher than the unweighted rates. This indicates that the bulls higher in semen fertility have more first services than those of lower fertility. The nonreturn rate is increased nearly 1 percent because of this relation-ship.

The weighted 60- to 90-day nonreturn rates ("effective nonreturn rates") varied from 65 to 75 percent. Among the five prevalent dairy breeds, Jerseys were highest (70.0 and 72.7 percent) and Guernseys were lowest (65.6 and 67.8 percent). The effective nonreturn rate for Holsteins was 69.7 percent in 1967 and increase to 71.4 percent in 1968. The effective nonreturn rate for Brown Swiss and Ayrshire improved only slightly from 1967 to 1968; all averages were between 69.6 and 70.1 percent. Overall the effective nonreturn rate was 1.6 percent higher in 1968 than in 1967.

Confidence intervals were calculated for the unweighted nonreturn rates on the regular service bulls by breeds. Guernsey bulls were significantly lower (99 percent accuracy) than were the Ayrshire, Brown Swiss, Holstein, and Jersey bulls in both years. Jersey bulls were significantly higher

(90 percent accuracy) than were the Ayrshire, Brown Swiss, and Holstein bulls in both years. Part of the differences among breeds in nonreturn rates may be due to different policies on re-breeding cows. However, it seems unlikely that differences as large as those observed would be accounted for by such policies.

The averages for Milking Shorthorns and Red Danes were based on information on four to 20 bulls, and for this reason may not give reliable indications of the nonreturn rates for these breeds. Nevertheless, the weighted average 60- to 90-day nonreturn rates for Milking Shorthorns were high--74.7 percent in 1968 and 75.0 percent in 1967.

The 1968 data in table 3 indicate that the effective 60- to 90-day nonreturn rates for regular-service bulls were from 0.9 to 5.0 percent higher than those for progeny-test bulls in the five breeds with both types. In 1967 (table 4) the progeny-test bulls had higher effective 60- to 90-day nonreturn rates than the regular-service bulls in the Ayrshire, Guernsey, Holstein, and Milking Shorthorn breeds. The reason for the apparent shift in the relative nonreturn rates of regular-service and progeny-test bulls from 1967 to 1968 is unknown. Although nonreturn rates were generally improved for regular-service bulls in 1968, the effective nonreturn rates of progeny-test bulls decreased in all breeds having progeny-test bulls in both years. Possible influences are a change in age at sampling of the progeny-test bulls or a change in the percentage of first services with frozen semen.

With few exceptions the average nonreturn rates were lower for the special-request bulls than for the regular-service bulls. Semen used for the special-request services was probably from old bulls and may have been stored for a longer period than that from the regular-service bulls.

Table 5 shows the grouping of regular-service bulls according to their nonreturn rate. In 1967, 44.9 percent of all regular-service bulls had a 60- to 90-day nonreturn rate greater than 70 percent. In 1968, 55.9 percent of the regular-service bulls were above 70 percent. This favorable increase in nonreturn rate could reflect better management

practices in breeding, improved semen preparation, or selection against low fertility bulls.

To justify the use of a bull in regular service with a 60- to 90-day nonreturn rate under 60 percent seems difficult, unless the individual was extremely outstanding in transmitting production. Yet, there were 37 regular-service bulls reported with nonreturn rates below this level in 1968 and 60 in 1967. Of these bulls with low nonreturn rates 16 in 1968 and 23 in 1967 were Guernseys.

Increasing nonreturn rates, thus improving conception rate, has substantial economic benefit within each of the breeds. For this reason bulls having low nonreturn rates should be so identified, giving dairymen some measure of prospects of conception. Dairymen who have the Guernsey breed should be particularly interested in finding those bulls with subnormal fertility and restricting their use in order to maintain calving intervals near optimum (12 to 13 months).

The distribution of special-request bulls grouped by their nonreturn rate is given in table 6. A high proportion of the bulls of this type had 60- to 90-day nonreturns less than 60 percent (21.4 percent in 1967 and 16.6 percent in 1968). Low nonreturn rates may have been a reason for changing bulls from regular to special-request service. In spite of their lower fertility, the special-request bulls probably represent a select group with respect to production or other traits, thus any special storage and handling of semen may be justified.

The distribution of progeny-test bulls with respect to nonreturn rates is given in table 7. It is clear that these young bulls vary substantially in fertility as estimated by nonreturn rate. Although the nonreturn data are based on fewer first services, the percentage of bulls falling in each nonreturn level for the average of both years is similar to that for the regular-service bulls. The percentages of bulls in the various nonreturn categories suggest that some breed differences are present in the progeny-test groups. If nonreturn rates during progeny testing are an indication of future measures of the same, then selection among young bulls could help assure higher nonreturn levels in regular-service

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bulls.

When cows repeat estrus after one or more services from older bulls, dairymen and inseminators have been known to breed such cows to semen from young bulls, with the hope of improving the chances of conception. From these results, it seems clear that the selection of a service bull for this purpose should be done by considering the individual bull's 60- to 90-day nonreturn rate, and not merely his type of service.

Tables 8 and 9 give 60- to 90-day nonreturn rates according to breed and number of services for bulls in regular service in 1968 and 1967, respectively. These clearly show a relationship between nonreturn rate and the amount of utilization of individual bulls. Any influence that frequency of collecting semen from bulls has upon nonreturn rate is part of such a relationship.

In breeds and years for which one or more regular-service bulls had over 20,000 inseminations, the average nonreturn rates of such bulls were from 2.5 to 6.9 percent higher than the rates for bulls with less than 1,000 services. These same heavily used bulls had rates that were from 1.3 to 5.6 percent higher than those for bulls with 1,000 to 5,000 services.

The more extensive utilization of bulls in AI having high nonreturn rates has undoubtedly been of substantial economic benefit by shortening the interval between consecutive calvings of the cows serviced. It is not known, however, to what extent selection for milk production has been relaxed to improve conception. This can be answered only by considering together the information on nonreturn rate and milk production.

Tables 10 and 11 give the nonreturn rates according to breed and number of services for special-request bulls in 1968 and 1967. These averages are based on a smaller number of bulls but appear to show a pattern similar to that of the regular-service bulls. In 1968 (table 10) the average 60- to 90-day nonreturns for special-request bulls ranged from 5.9 to 12.6 percent higher for bulls with more than 1,000 first

services than for bulls with less than 1,000 first services.

Tables 12 and 13 give nonreturn rates by number of services for bulls on progeny testing in 1968 and 1967. It is evident that a positive relationship between 60- to 90-day nonreturn rate and number of services exists within this group, the same as with the other groups. The progeny test bulls having 1,000 to 5,000 services generally had higher average nonreturn rates than those with less than 1,000 services. For the Holsteins weighted and unweighted differences in average 60- to 90-day nonreturns ranged from 0 to 2.6 percent in favor of the more heavily used bulls. Those few progeny-test bulls having more than 5,000 first services were considerably higher in nonreturn rate than those in the lower utilization groups.

A number of factors are apparent from this analysis of 60- to 90-day nonreturn rates of individual AI bulls. There is evidence that breed differences in nonreturn rates do exist. Bulls of the Guernsey breed have lower nonreturn rates than those of most of the other dairy breeds. However, a more complete source of information is needed to determine if differences in nonreturn rates by breeds are genetic or merely represent variation in management practices.

Average 60- to 90-day nonreturns were about the same for regular-service bulls as for progeny-test bulls, indicating dairymen should not expect to reduce calving intervals solely by using progeny-test bulls. Nonreturn rates for special-request bulls were slightly lower than those for bulls in regular service.

Selection of specific bulls based on nonreturn rates has been used to improve conception rates. Heavy use of bulls having high nonreturn rates gave an effective increase in 60- to 90-day nonreturns of about 1 percent in 1967 and 1968.

High levels of herd fertility are helpful in providing short term economic benefits to dairymen and should be considered in efforts to maximize genetic progress for traits such as milk production. Dairymen should continue to give some consideration to nonreturn rates when selecting AI bulls

for use in their herd.   Information on nonreturn rates should
be made more readily available to dairymen, particularly when
bulls' nonreturn rates are substantially below breed average.

New ideas are needed in research to find methods of
improving levels of fertility through selection, semen
preparation, or changes in management practices.
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ERRATUM: For May 1970 Dairy-Herd-Improvement Letter,
ARS 44-215, the placement of the maps was reversed.   The map
on page 19 shows the data in table 2, and the map on page 20
shows the data in table 1.

TABLE 1.--Number of AI bulls and first services, by breed and type of service, 1968
(Bulls for which first services and nonreturn rates were reported)

Breed	Bulls				Services			
	Regular	Special mating	Progeny test	All used	Regular	Special mating	Progeny test	All used
	Number							
Ayrshire-----	35	--	6	41	54,661	------	1,127	55,788
Guernsey-----	111	8	30	149	332,057	4,291	16,957	353,305
Holstein-----	523	41	211	775	4,475,027	41,090	145,918	4,662,035
Jersey-------	93	8	30	131	266,932	5,248	12,228	284,408
Brown Swiss-	45	2	9	56	124,412	943	5,718	131,073
M.Shorthorn-	19	1	---	20	26,240	207	------	26,447
Red Dane-----	4	--	---	4	248	------	------	248
Total----	830	60	286	1,176	5,279,577	51,779	181,948	5,513,304

TABLE 2.--Number of AI bulls and first services, by breed and type of service, 1967
(Bulls for which first services and nonreturn rates were reported)

Breed	Bulls				Services			
	Regular	Special mating	Progeny test	All used	Regular	Special mating	Progeny test	All used
	------------------------------------ Number ------------------------------------							
Ayrshire-------	33	1	1	35	63,228	9	139	63,376
Guernsey-------	125	14	35	174	295,841	7,666	54,187	357,694
Holstein-------	517	43	163	723	3,896,110	84,639	272,810	4,253,559
Jersey---------	86	5	29	120	258,102	3,543	17,620	279,265
Brown Swiss---	47	5	15	67	89,529	1,808	21,634	112,971
M.Shorthorn--	17	2	2	21	23,591	645	5,139	29,375
Red Dane------	4	--	---	4	217	-------	-------	217
Total-------	829	70	245	1,144	4,626,618	98,310	371,529	5,096,457

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TABLE 3.--Average 60- to 90-day nonreturn rates, in percent, to first service by breed and type of service, 1968 [1]/

| Breed | Service group | | | Overall |
	Regular	Special mating	Progeny test	
Average unweighted[2]/ percent nonreturn rates				
Ayrshire----	70.0	----	66.7	69.5
Guernsey----	66.6	68.8	62.2	65.8
Holstein----	70.5	67.0	68.8	69.9
Jersey------	71.5	69.2	69.9	71.0
Brown Swiss-	70.0	62.9	70.9	69.9
M.Shorthorn-	73.7	68.0	----	73.4
Red Dane----	65.0	----	----	65.0
Average weighted[3]/ percent nonreturn rates				
Ayrshire----	70.2	----	65.2	70.1
Guernsey----	67.9	72.6	64.6	67.8
Holstein----	71.4	70.8	70.5	71.4
Jersey------	72.9	69.5	68.4	72.7
Brown Swiss-	70.2	66.5	68.7	70.1
M.Shorthorn-	74.8	68.0	----	74.7
Red Dane----	65.0	----	----	65.0

[1]/ Based on 1,176 bulls for which information was available.

[2]/ All bulls given equal weight regardless of number of services.

[3]/ Each bull weighted by the number of services. This is the "effective" nonreturn rate.

TABLE 4.--Average 60- to 90-day nonreturn rates, in percent to first service by breed and type of service, 1967 1/

| Breed | Service group | | | Overall |
	Regular	Special mating	Progeny test	
Average unweighted 2/ percent nonreturn rates				
Ayrshire----	67.6	55.0	72.1	67.3
Guernsey----	64.2	63.0	66.0	64.5
Holstein----	69.0	67.1	69.5	69.0
Jersey------	69.9	64.6	66.2	68.8
Brown Swiss-	69.0	68.4	69.9	69.1
M.Shorthorn-	70.7	74.4	71.4	71.1
Red Dane----	74.5	----	----	74.5
Average weighted 3/ percent nonreturn rates				
Ayrshire----	70.0	55.0	72.1	70.0
Guernsey----	65.2	61.3	68.5	65.6
Holstein----	69.7	67.9	70.6	69.7
Jersey------	70.0	64.5	69.8	70.0
Brown Swiss-	69.7	66.5	69.8	69.6
M.Shorthorn-	73.8	74.1	80.8	75.0
Red Dane----	68.5	----	----	68.5

    1/ Based on 1,144 bulls for which information was available.

    2/ All bulls given equal weight regardless of number of services.

    3/ Each bull weighted by number of services. This is the "effective" nonreturn rate.

TABLE 5.--Distribution of AI bulls in regular service according to their 60- to 90-day nonreturn rates, by breed, 1968 and 1967

Year and breed	Unweighted average	Percent of bulls in nonreturn rate intervals							AI bulls	
		<50	50-54.9	55-59.9	60-64.9	65-69.9	70-74.9	≥75	No.	Pct.1/
1968										
Ayrshire-----	70.0	0	2.9	5.7	14.3	37.1	17.1	22.9	35	85.4
Guernsey-----	66.6	1.8	4.5	8.1	20.7	36.9	19.8	8.1	111	74.5
Holstein-----	70.5	.4	.6	2.1	9.4	24.9	46.7	16.1	523	67.5
Jersey-------	71.5	0	0	0	9.7	31.2	33.3	25.8	93	71.0
Brown Swiss--	70.0	0	0	4.4	11.1	40.0	33.3	11.1	45	80.4
M.Shorthorn--	73.7	0	0	0	0	15.8	42.1	42.1	19	95.0
Red Dane-----	65.0	0	0	0	0	100.0	0	0	4	100.0
All breeds-	70.1	.5	1.1	2.9	11.0	28.7	39.3	16.6	830	70.6
1967										
Ayrshire-----	67.6	3.0	0	9.1	27.3	27.3	18.2	15.2	33	94.3
Guernsey-----	64.2	4.8	2.4	11.2	24.8	40.8	13.6	2.4	125	71.8
Holstein-----	69.0	.8	1.0	2.9	11.2	34.4	39.5	10.3	517	71.5
Jersey-------	69.9	0	1.2	2.3	9.3	33.7	38.4	15.1	86	71.7
Brown Swiss--	69.0	0	4.3	4.3	12.8	29.8	38.3	10.6	47	70.1
M.Shorthorn--	70.7	5.9	0	0	5.9	17.6	47.1	23.5	17	81.0
Red Dane-----	74.5	0	25.0	0	0	0	0	75.0	4	100.0
All breeds-	68.4	1.4	1.4	4.3	13.6	34.3	34.5	10.4	829	72.5

1/ Regular-service AI bulls as a percent of all AI bulls of the breed.

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TABLE 6.--Distribution of AI bulls available through special request according to their 60- to 90-day nonreturn rates, by breed, 1968 and 1967

| Year and breed | Percent of bulls in nonreturn rate invervals | | | | | | | | AI bulls | |
	Unweighted average	<50	50-54.9	55-59.9	60-64.9	65-69.9	70-74.9	≥75	No.	Pct. 1/
1968										
Ayrshire-----	0	0	0	0	0	0	0	0	0	0
Guernsey-----	68.8	0	0	12.5	25.0	25.0	12.5	25.0	8	5.4
Holstein-----	67.0	0	12.2	4.9	12.2	29.3	29.3	12.2	41	5.3
Jersey-------	69.2	0	0	12.5	0	50.0	12.5	25.0	8	6.1
Brown Swiss-	62.9	0	0	50.0	0	50.0	0	0	2	3.6
M.Shorthorn-	68.0	0	0	0	0	100.0	0	0	1	5.0
Red Dane-----	0	0	0	0	0	0	0	0	0	0
All breeds-	67.4	0	8.3	8.3	11.7	33.3	23.3	15.0	60	5.1
1967										
Ayrshire-----	55.0	7.1	0	100.0	0	0	0	0	1	2.9
Guernsey-----	63.0	7.1	7.1	21.4	21.4	14.3	14.3	14.3	14	8.0
Holstein-----	67.1	7.0	7.0	7.0	14.0	25.6	25.6	14.0	43	5.9
Jersey-------	64.6	0	0	0	60.0	40.0	0	0	5	4.2
Brown Swiss-	68.4	0	0	0	20.0	40.0	40.0	0	5	7.5
M.Shorthorn-	74.4	0	0	0	0	0	50.0	50.0	2	9.5
Red Dane-----	0	0	0	0	0	0	0	0	0	0
All breeds-	66.2	5.7	5.7	10.0	18.6	24.3	22.9	12.9	70	6.1

1/ Special-request AI bulls as a percent of all AI bulls of the breed.

TABLE 7.--Distribution of AI bulls on progeny testing according to their 60- to 90-day nonreturn rates, by breed, 1968 and 1967

Year and breed	Percent of bulls in nonreturn rate intervals								AI bulls	
	Unweighted average	<50	50-54.9	55-59.9	60-64.9	65-69.9	70-74.9	≥75	No.	Pct. 1/
1968										
Ayrshire-----	66.7	0	0	16.7	16.7	50.0	0	16.7	6	14.6
Guernsey-----	62.2	13.3	0	13.3	20.0	26.7	20.0	6.7	30	20.1
Holstein-----	68.8	.5	1.9	5.2	12.8	35.5	30.3	13.7	211	27.2
Jersey-------	69.9	3.3	3.3	0	10.0	36.7	26.7	20.0	30	22.9
Brown Swiss--	70.3	0	0	0	11.1	44.4	22.2	22.2	9	16.1
M.Shorthorn--	0	0	0	0	0	0	0	0	0	0
Red Dane-----	0	0	0	0	0	0	0	0	0	0
All breeds-	68.2	2.1	1.7	5.6	13.3	35.3	28.0	14.0	286	24.3
1967										
Ayrshire-----	72.1	0	0	0	0	0	100.0	0	1	2.9
Guernsey-----	66.0	2.9	0	5.7	25.7	42.9	17.1	5.7	35	20.1
Holstein-----	69.5	.6	1.8	4.3	13.5	26.4	38.0	15.3	163	22.5
Jersey-------	66.2	3.4	10.3	0	13.8	41.4	17.2	13.8	29	24.2
Brown Swiss--	69.9	0	0	0	13.3	40.0	33.3	13.3	15	22.4
M.Shorthorn--	71.4	0	0	0	50.0	0	0	50.0	2	9.5
Red Dane-----	0	0	0	0	0	0	0	0	0	0
All breeds-	68.7	1.2	2.4	3.7	15.5	31.0	32.2	13.9	245	21.4

1/ Progeny-test AI bulls as a percent of all AI bulls of the breed.

TABLE 8.--Average 60- to 90-day nonreturn rates, in percent,
for bulls in regular service, by breed and
inseminations per bull, 1968

| Breed | Nonreturn rates per bull grouped by number of services per bull | | | | |
	1 to 999	1,000 to 4,999	5,000 to 9,999	10,000 to 19,999	20,000 and over
	Average unweighted[1] percent nonreturn rates				
Ayrshire----	68.8	71.3	65.0	----	----
Guernsey----	66.1	66.0	69.6	68.3	70.0
Holstein----	69.2	70.3	70.6	71.4	71.7
Jersey------	70.6	71.4	72.1	75.6	----
Brown Swiss-	70.8	69.5	67.4	72.0	75.0
M.Shorthorn-	72.8	74.3	----	----	----
Red Dane----	65.0	----	----	----	----
	Average weighted[2] percent nonreturn rates				
Ayrshire----	65.2	71.8	65.0	----	----
Guernsey----	63.2	66.7	69.5	68.6	70.0
Holstein----	68.0	70.7	70.7	71.5	72.0
Jersey------	71.8	72.0	72.3	75.1	----
Brown Swiss-	68.1	69.4	67.5	72.0	75.0
M.Shorthorn-	74.4	74.8	----	----	----
Red Dane----	65.0	----	----	----	----
	Number of bulls				
Ayrshire----	15	19	1	--	--
Guernsey----	41	51	12	6	1
Holstein----	87	159	122	98	57
Jersey------	36	39	12	6	--
Brown Swiss-	20	18	5	1	1
M.Shorthorn-	8	11	--	--	--
Red Dane----	4	--	--	--	--

1/ All bulls given equal weight regardless of number of services.

2/ Each bull weighted by the number of services. This is the "effective" nonreturn rate.

TABLE 9.--Average 60- to 90-day nonreturn rates, in percent,
for bulls in regular service, by breed and
inseminations per bull, 1967

| Breed | Nonreturn rates per bull grouped by number of services per bull | | | | |
	1 to 999	1,000 to 4,999	5,000 to 9,999	10,000 to 19,999	20,000 and over
	Average unweighted[1]/ percent nonreturn rates				
Ayrshire----	63.6	69.4	71.1	----	----
Guernsey----	63.3	64.9	65.3	65.0	----
Holstein----	67.4	68.9	69.3	69.8	70.2
Jersey------	70.5	69.1	70.1	72.9	----
Brown Swiss-	68.7	68.9	70.5	----	----
M.Shorthorn-	65.7	74.2	----	----	----
Red Dane----	74.5	----	----	----	----
	Average weighted[2]/ percent nonreturn rates				
Ayrshire----	65.7	70.3	70.3	----	----
Guernsey----	62.7	65.6	65.5	65.0	----
Holstein----	67.1	68.8	69.4	69.8	70.3
Jersey------	70.1	68.4	70.1	72.8	----
Brown Swiss-	68.6	69.4	70.4	----	----
M.Shorthorn-	72.1	74.1	----	----	----
Red Dane----	68.5	----	----	----	----
	Number of bulls				
Ayrshire----	11	20	2	--	--
Guernsey----	60	48	13	4	--
Holstein----	90	154	128	106	39
Jersey------	30	38	15	3	--
Brown Swiss-	20	23	4	--	--
M.Shorthorn-	7	10	--	--	--
Red Dane----	4	--	--	--	--

[1]/ All bulls given equal weight regardless of number of
services.

[2]/ Each bull weighted by the number of services. This
is the "effective" nonreturn rate.

TABLE 10.--Average 60- to 90-day nonreturn rates, in percent,
for bulls available through special request,
by breed and inseminations per bull, 1968

Breed	Nonreturn rates per bull grouped by number of services per bull		
	1 to 999	1,000 to 4,999	5,000 to 9,999
	Average unweighted[1] percent nonreturn rates		
Ayrshire----	----	----	----
Guernsey----	66.9	74.5	----
Holstein----	64.8	72.2	72.0
Jersey------	68.1	77.0	----
Brown Swiss-	62.9	----	----
M.Shorthorn-	68.0	----	----
Red Dane----	----	----	----
	Average weighted[2] percent nonreturn rates		
Ayrshire----	----	----	----
Guernsey----	65.8	74.5	----
Holstein----	66.1	72.0	72.0
Jersey------	64.4	77.0	----
Brown Swiss-	66.5	----	----
M.Shorthorn-	68.0	----	----
Red Dane----	----	----	----
	Number of bulls		
Ayrshire----	--	--	--
Guernsey----	6	2	--
Holstein----	29	10	2
Jersey------	7	1	--
Brown Swiss-	2	--	--
M.Shorthorn-	1	--	--
Red Dane----	--	--	--

1/ All bulls given equal weight regardless of number
of services.

2/ Each bull weighted by the number of services. This
is the "effective" nonreturn rate.

TABLE 11.--Average 60- to 90-day nonreturn rates, in percent,
          for bulls available through special request,
          by breed and inseminations per bull, 1967

Breed	Nonreturn rates per bull grouped by number of services per bull			
	1 to 999	1,000 to 4,999	5,000 to 9,999	10,000 to 19,999
	Average unweighted[1] percent nonreturn rates			
Ayrshire----	55.0	----	----	----
Guernsey----	63.0	63.0	----	----
Holstein----	66.9	66.4	70.3	65.6
Jersey------	64.3	65.0	----	----
Brown Swiss-	69.5	64.1	----	----
M.Shorthorn-	74.4	----	----	----
Red Dane----	----	----	----	----
	Average weighted[2] percent nonreturn rates			
Ayrshire----	55.0	----	----	----
Guernsey----	62.2	60.7	----	----
Holstein----	65.7	66.8	70.3	65.6
Jersey------	63.7	64.8	----	----
Brown Swiss-	70.1	64.1	----	----
M.Shorthorn-	74.1	----	----	----
Red Dane----	----	----	----	----
	Number of bulls			
Ayrshire----	1	--	--	--
Guernsey----	11	3	--	--
Holstein----	23	14	5	1
Jersey------	3	2	--	--
Brown Swiss-	4	1	--	--
M.Shorthorn-	2	--	--	--
Red Dane----	--	--	--	--

1/ All bulls given equal weight regardless of number
of services.
    2/ Each bull weighted by the number of services. This
is the "effective" nonreturn rate.

TABLE 12.--Average 60- to 90-day nonreturn rates, in percent,
for bulls on progeny testing, by breed and
inseminations per bull, 1968

| Breed | Nonreturn rates per bull grouped by number of services per bull | | |
	1 to 999	1,000 to 4,999	5,000 to 9,999
	Average unweighted[1] percent nonreturn rates		
Ayrshire----	66.7	----	----
Guernsey----	61.5	66.9	----
Holstein----	68.2	70.8	83.0
Jersey------	70.1	68.5	----
Brown Swiss-	71.4	67.0	----
M.Shorthorn-	----	----	----
Red Dane----	----	----	----
	Average weighted[2] percent nonreturn rates		
Ayrshire----	65.2	----	----
Guernsey----	63.3	65.9	----
Holstein----	68.7	70.9	83.0
Jersey------	68.3	68.5	----
Brown Swiss-	69.3	67.0	----
M.Shorthorn-	----	----	----
Red Dane----	----	----	----
	Number of bulls		
Ayrshire----	6	--	--
Guernsey----	26	4	--
Holstein----	165	45	1
Jersey------	26	4	--
Brown Swiss-	8	1	--
M.Shorthorn-	--	--	--
Red Dane----	--	--	--

[1] All bulls given equal weight regardless of number of services.

[2] Each bull weighted by the number of services. This is the "effective" nonreturn rate.

TABLE 13.--Average 60- to 90-day nonreturn rates, in percent,
for bulls on progeny testing, by breed and
inseminations per bull, 1967

Breed	Nonreturn rates per bull grouped by number of services per bull		
	1 to 999	1,000 to 4,999	5,000 to 9,999
Average unweighted[1]/ percent nonreturn rates			
Ayrshire----	72.1	----	----
Guernsey----	64.5	67.5	69.8
Holstein----	69.1	69.5	72.1
Jersey------	65.6	69.1	----
Brown Swiss-	69.6	70.3	71.1
M.Shorthorn-	61.8	----	81.0
Red Dane----	----	----	----
Average weighted[2]/ percent nonreturn rates			
Ayrshire----	72.1	----	----
Guernsey----	65.9	68.7	69.8
Holstein----	69.5	69.5	72.1
Jersey------	67.6	71.3	----
Brown Swiss-	68.5	69.6	71.1
M.Shorthorn-	61.8	----	81.0
Red Dane----	----	----	----
Number of bulls			
Ayrshire----	1	--	--
Guernsey----	18	16	1
Holstein----	95	51	17
Jersey------	24	5	--
Brown Swiss-	10	4	1
M.Shorthorn-	1	--	1
Red Dane----	--	--	--

1/ All bulls given equal weight regardless of number
of services.

2/ Each bull weighted by the number of services. This
is the "effective" nonreturn rate.